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DATE: January 24, 2014

SUBJECT: NON-AGRICULTURAL ASSOCIATED PESTICIDE RELATED ILLNESS CASES IN ALAMEDA, LOS ANGELES, ORANGE, SAN FRANCISCO AND SANTA CLARA COUNTIES

Background

The Pesticide Illness Surveillance Program (PISP) received a request from the Department of Pesticides (DPR) executive office to summarize pesticide related illnesses and injuries due to "consumer-use" products in an "urban" setting. The PISP database, as robust as it is, does not include a simple way to search for such situations. We adopted the US Census Bureau definition of "urban" for the purpose of this analysis. The US Census Bureau defines *urbanized areas* as a densely developed territory and encompasses residential, commercial and other nonresidential urban land uses of 50,000 or more people. Most people who live in these areas have nonagricultural jobs. According to the 2010 Census, urban areas now account for 80.7% of US population and seven of the top 10 most densely populated urbanized areas are in California. We selected the top three urbanized areas for this analysis (Los Angeles-Long Beach-Anaheim, San Francisco-Oakland and San Jose). The PISP database collects the county information in which an exposure has occurred, therefore, we used the respective counties for our selection criteria (Los Angeles, Orange, San Francisco, Alameda and Santa Clara).

We reviewed occupational and non-occupational illnesses separately in an attempt to identify exposure situations that may be of concern.

Three separate analyses of pesticide illness involving foggers, antimicrobials, and those occurring at primary school settings are also available for review.

PISP Terminology

A **case** is the Pesticide Illness Surveillance Program's representation of a pesticide exposure and its apparent effects on one individual's health.

Associated cases are those evaluated as definitely, probably, or possibly related to pesticide exposure. A relationship of definite indicates that both physical and medical evidence document exposure and consequent health effects. Probable relationship indicates that circumstantial evidence supports a relationship to pesticide exposure. A possible relationship indicates that evidence neither supports nor contradicts a relationship.

An **episode** is an incident in which one or more people experience pesticide exposure from a particular source with subsequent development or exacerbation of symptoms.

A **priority** case is an episode that meets priority criteria, which include: (1) more than 5 persons were exposed, (2) a person was admitted to a hospital, or (3) death occurred.

Enforcement actions often are still under consideration when DPR receives the illness investigative reports, thus linking cases to Enforcement Branch violations is approximate. A PISP **violation** is based on information available at the time of evaluation, and is characterized as either: (1) Failure to use required equipment, (2) Early Reentry, (3) Other misuse of label, (4) Non-contributory (paperwork), (5) Unknown, or (6) None.

Overview

From 2008-2010, 635 pesticide illnesses were evaluated as definitely, probably, or possibly associated with pesticide exposure in Los Angeles, Orange, Alameda, Santa Clara, and San Francisco counties.

The following table describes the case distribution among the five counties.

County	Total	Occupational	Non-Occupational
Alameda	56	26	30
Los Angeles	360	158	202
Orange	120	55	65
San Francisco	27	15	12
Santa Clara	64	41	23

Non-occupational illnesses accounted for 332 cases, and 295 cases occurred while an individual was at work. Occupational status remained unknown in eight cases.

Non-Occupational Illnesses in Urban Settings

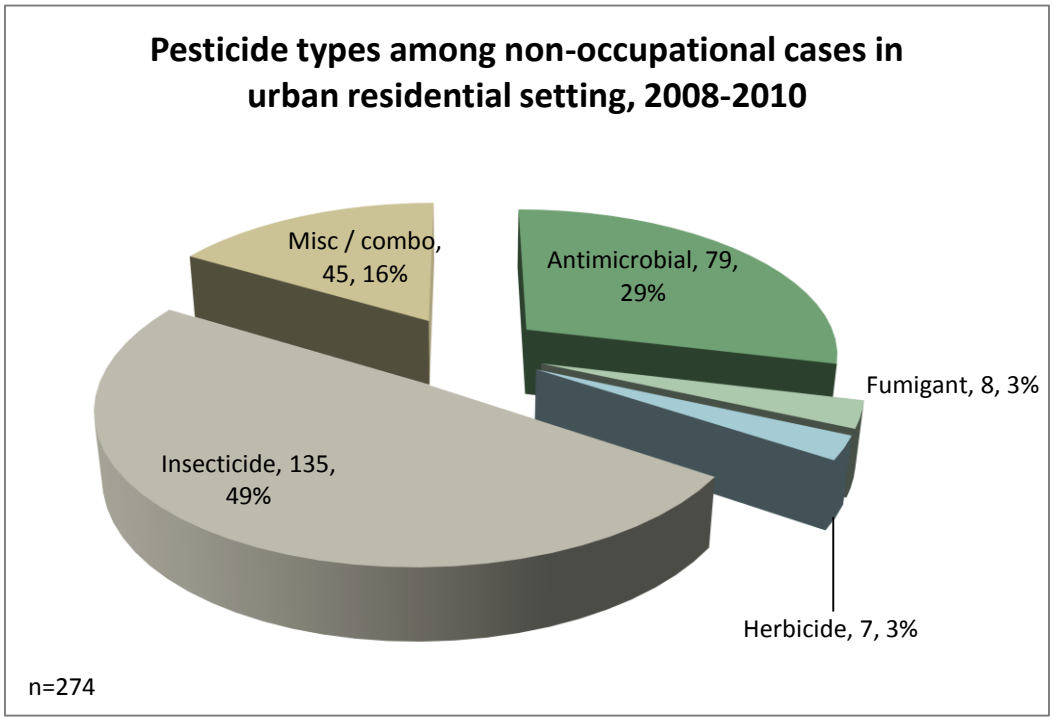
A total of 332 non-occupational illness were evaluated as associated with pesticide exposure from 2008-2010 in the sampled counties.

Incident Setting	Cases	Notes
Hospital/Medical	1	
Landscape, Lawn & Other	**6**	
MFD, SFD, Residence	**261**	
Other (Telephone Poles, Fences, Etc)	**7**	
Park	9	7 from 1 incident
Prison	2	
Residential Institution	1	
Retail Establishment	2	
Road/Rail Or Utility Right Of Way	3	
School	6	from 1 incident
Service Establishment	8	from 1 incident
Unknown	26	

The majority of the cases occurred at home (261, 78.6%). The remaining associated cases occurred in non-residential locations such as Park, Service Establishment or School. This category also included individuals on the way to or from work, i.e., before the start or after the end of their workday.

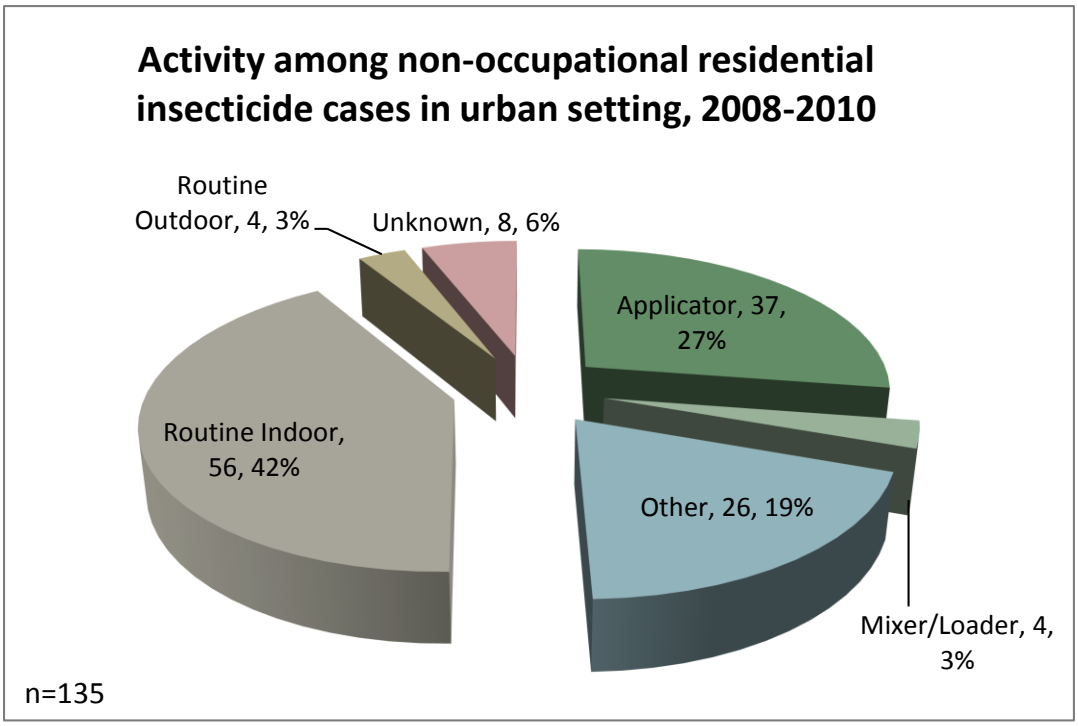
Most of the cases were single individual exposures with the exception of those occurring in a Park, School and Service Establishment. All of these cases involved children (age 6 to 15) who became ill after being exposed to pool chemicals in a public swimming pool. There were two episodes involving nine persons that occurred in a Park with one episode meeting the criteria for a priority case. Both of the incidents at School and Service Establishments were single priority episodes.

To better understand illnesses associated with consumer-use pesticide products in urban areas, we grouped the following incident settings: Landscape, Residences (Multi Family Dwellings (MFD), Single Family Dwellings (SFD), Residence, Other) and Other (Telephone Poles, Fences, Etc.). These accounted for 83% (n=274) of the associated cases in non-occupational setting. Subsequent analysis will be based on this population subset which from hereon will be referred to as “Residential”.



In non-occupational cases, insecticides and antimicrobials were the two most commonly implicated pesticides of associated cases in Residential setting, 49% and 29% (n=135, 79), respectively. Miscellaneous or combination (Misc/combo) pesticides accounted for 30 cases or 16% of the type of pesticide involved, two of which were priority episodes involving 27 cases. One episode involved tenants of a property whose owner took it upon himself to apply an insecticide to treat for cockroaches with a product primarily used for termite control by licensed termiticide applicators only. He then refilled the back pack sprayer with quaternary ammonia solution to help with the bug spray odor. The other episode involved neighbors of a homeowner who over-applied paradichlorobenzene (repellent) around his house. During the investigation, investigators observed dozens of mothballs, labeled for indoor use only, hanging from trees in netted sacs as well as strewn about the grass. The homeowner refused to speak to the investigators, however, her son stated that the mothballs were to control fruit flies, bats, birds and rats, as well as the smell of dog excrement. Due to the complexity of analyzing combined pesticide types, our analysis will be based on the 2 major pesticide types in associated cases implicated in Residential setting, insecticide and antimicrobial. These two pesticides account for 78% of all non-occupational associated cases in Residential setting.

Insecticide



Applicator: Applies pesticides by any method or conducts activities considered ancillary to the application (e.g., cleans spray nozzles in the field).
Routine Indoor: Conducts activities in an indoor environment with minimal expectation for exposure to pesticides. This includes people in offices and businesses, residential structures, etc. who are not handling pesticides.
Routine Outdoor: Conducts activities in an outdoor environment with minimal expectation for exposure to pesticides. This excludes field workers in agricultural fields. This includes gardeners who are not handling pesticides.
Mixer/Loader: Mixes and/or loads pesticides. This includes: (1) removing a pesticide from its original container; (2) transferring the pesticide to a mixing or holding tank; (3) mixing pesticides prior to application; (4) driving a nurse rig; or (5) transferring the pesticide from a mix/holding tank or nurse rig to an application tank.
Other: Activity is not adequately described by any other activity category. This includes: 1) being inside a vehicle; 2) dog groomers not handling pesticides; 3) individuals handling pesticide treated wood; and 4) two or more activities with potential for pesticide exposure.
Unknown: Activity is unknown.

Routine (Indoor and Outdoor) activities, with minimal expectation for exposure to pesticide, accounted for 45% (n=60) of activities when exposure to insecticide in Residential setting occurred. Of the 60 cases involving exposure while performing routine activities, 56% (n=33) of the cases involved children under 18 years old. Persons applying a pesticide account for 27% (n=37) of Residential exposures followed by "Other" at 19% (n=26). PISP defines "Other" activities as one with an increased risk of pesticide exposure in some way not expressed by any defined activity. Many of these cases involved homeowners and tenants who re-entered the home after an application before the recommended period of time or properly vacating the premises.

Another episode involved homeowners who vacated their home after fumigation for the recommended amount of time and ventilated it upon their return but still developed symptoms.

PISP characterizes exposure to pesticide as how an individual came in contact with a pesticide. Exposures include drift, residue, direct spray/squirt, spill/other direct, ingestion, other, multiple, and unknown. Drift is defined as spray, mist, fumes, or odor carried from the target site by air. Residue is the part of a pesticide that remains in the environment for a period of time following an application or drift. Direct spray/squirt is material propelled by application or mix/load equipment. Spill/other direct refers to contact made during an application where the material is not propelled by the equipment, expected direct contact during use, and leaks or spills unrelated to an application. Ingestion may be intentional or unintentional. The exposure code "other" is another known route not included above, as smoke from a fire or residue from a spill.

Exposure among non-occupational residential cases in urban setting, 2008-2010

Residential - Insecticide	cases	%	Notes
Direct Spray/Squirt	9	6.7%	
Drift	19	14.1%	
Ingestion	23	17.0%	1 SPCO
Multiple Exposures	13	9.6%	2 SPCO
Other	17	12.6%	
Residue	19	14.1%	6 SPCO
Spill/Other Direct	19	14.1%	
Unknown	16	11.9%	
Total	135		

Drift: Spray, mist, fumes, or odor carried from the target site by air. Drift must be related to an application or mix/load activity.
Residue: The part of a pesticide that remains in the environment for a period of time following an application or drift.
Direct Spray/Squirt: Material propelled by the application or mix/load equipment.
Spill/Other Direct: Any of the following: 1) Contact made during an application or mixing/loading operation where the material is not propelled by the equipment; 2) Expected direct contact during use; 3) Leaks, spills, etc. not related to an application.
Ingestion: Intentional or unintentional oral ingestion.
Other: Other known route of exposure not included in other exposure categories.
Multiple: Contact with pesticides occurred through two or more mechanisms.
Unknown: Exposure is unknown.

Ingestion occurred in 17% of associated cases in Residential setting. Of the 23 associated cases, 5 were intentional ingestion. The remaining ingestion cases mostly involved improper storage such as putting the insecticide into a water bottle or leaving the insecticide unattended while in use where a child can have access.

Drift, Residue and Spill Other/Direct each accounted for 14.1% (n=19) of associated cases in Residential setting. Individuals performing Routine activities were the group that were mostly affected by these types of exposures (10 cases Drift, 12 cases Residue, 7 cases Spill/Other Direct).

Of the 135 non-occupational residential cases, 9 involved an SPCO.

Equipment used in non-occupational residential cases in urban setting, 2008-2010

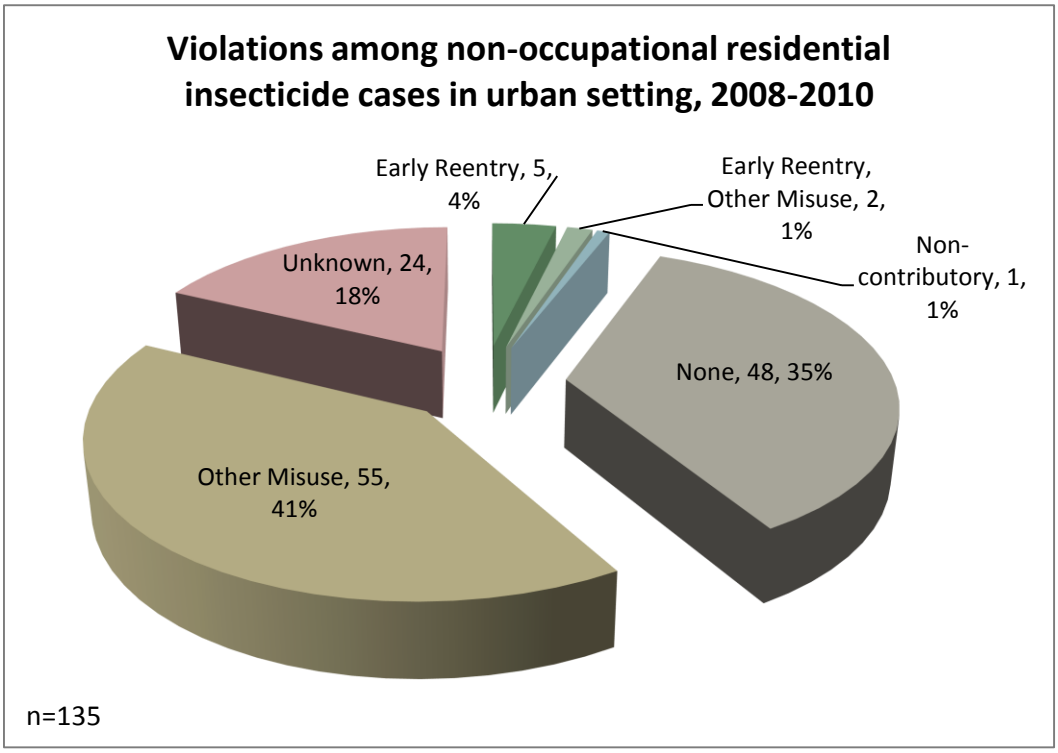
Residential - Insecticide	cases	%	Notes
Aerosol Can	16	11.9%	1 SPCO
Aerosol/Fog Generating Equipment	3	2.2%	2 SPCO
Foggers	40	29.6%	1 SPCO
Hand Pump Sprayer	6	4.4%	1 SPCO
Hand, Other or Unspecified	18	13.3%	1 SPCO
Hand-held Dusters	1	0.7%	
Immersion Equipment	1	0.7%	
Manual Methods	10	7.4%	
Unpressurized Hand-held Spray Equipment	14	10.4%	
Other	2	1.5%	2 SPCO
Not Applicable	17	12.6%	1 SPCO
Unknown	7	5.2%	
Total	135		

Aerosol Can: Disposable pressurized cans designed for intermittent use. The pesticide is propelled out of the can by an inert compressed gas propellant. This excludes Foggers.
Aerosol/Fog Generating Equipment: .Refillable equipment designed to disperse pesticide as a small airborne droplet, either in confined spaces or outdoor areas. These include truck-mounted equipment for outdoor use, hand-carried portable units and wall mounted electric units that are found in dairies, restaurants, etc.
Foggers: Disposable pressurized cans designed for the total release of the contents in a single use. The pesticide is propelled out of the can by an inert compressed gas propellant
Hand Pump Sprayer: Hand-held compressed air sprayer with small volume tanks (1 to 5 gallons). This excludes Back Pack Sprayers.
Hand, Other or Unspecified: Hand-held equipment, other or unspecified. The equipment must propel the pesticide from a reservoir. This includes 1) Hose-end Sprayers; 2) Two or more types of hand-held application equipment. This excludes: 1) H; 2) Hand Pump Sprayers; 3) Hand-held Dusters; 4) Back Pack Sprayers; 5) Unpressurized Hand-held Spray Equipment; 6) Aerosol Can; 7) Foggers; and 8) Aerosol/Fog Generating Equipment.
Hand-held Dusters: Hand-held compressed air sprayer with small volume tanks (1 to 5 gallons). This excludes Back Pack Sprayers.
Immersion Equipment: Tanks, trays, sinks, etc. used for the dipping of animals, produce, bulbs, medical equipment, dishes, pots and pans, etc.
Manual Methods: Combination of Manual Application Methods, Other or Unspecified and Manual Placement.
Manual Application Methods, Other or Unspecified: The pesticide is not propelled by any type of equipment.
Manual Placement: Manual placement of a pesticide directly to a target site. This includes bait stations, hand tossed pellets, and direct pouring of a pesticide onto a target surface from a container.
Unpressurized Hand-held Spray Equipment: Hand-held spray bottles (usually plastic) with built-in finger triggers.
Other: Any application methodology not described above. This includes two or more types of application equipment not elsewhere specified.
Not Applicable: No application equipment is involved.
Unknown: Method of application was not able to be determined.

Foggers was the most common form of equipment used, accounting for nearly a third (n=40, 29.6%) of associated illnesses that occurred in Residential settings. Only one case involved an SPCO, therefore, nearly all of the foggers were used by persons in the home. There were 23

cases involving foggers with identified active ingredient(s). Of these 23 cases, 14 contained cypermethrin either by itself or in combination with other active ingredient(s). Spill/Other Direct and Drift were the two most common type of exposure due to foggers in Residential setting, 25% and 22.5% respectively, followed by Residue at 15%. A separate analysis of pesticide illness involving foggers in more detail can be found here.

Hand, Other or Unspecified, Not Applicable and Aerosol Can were other types of equipment implicated in an exposure. There were 17 (12.6%) associated cases where equipment was classified as "Not Applicable". Twelve of these 17 cases were due to ingestion.



Early Reentry: Reentered a pesticide-treated area prior to the expiration of the restricted entry interval set by regulation or listed on the product label. This excludes reentry that meets the requirements specified by the California Code of Regulations (3CCR Sections 6770 and 6771).
Other Misuse: Any violation of pesticide safety requirements other than those defined above. This only applies if not following the label or regulations contributed to the exposure.
None: Information provided in the investigation report shows no violation occurred. Specific statements reporting that "no violation was found" will be disregarded if the investigation report indicates otherwise.
Unknown: The type of violation that occurred, if any, is not known. This includes potential violations noted in the investigation, but not substantiated due to lack of evidence.

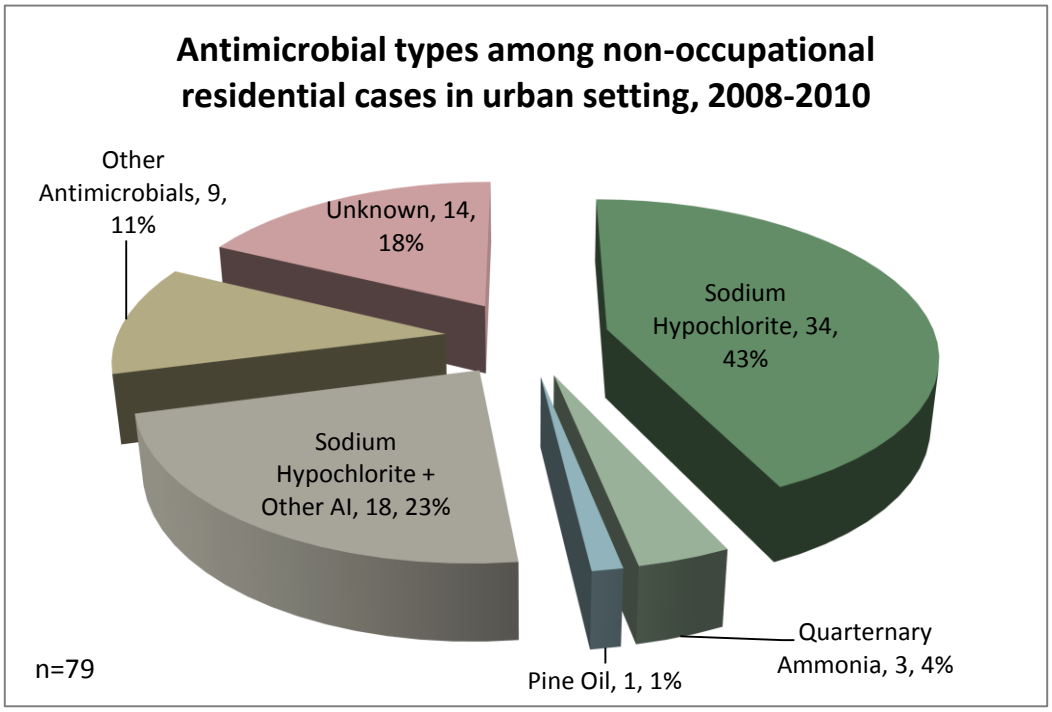
The majority of the violations in the associated cases in Residential setting was Other Misuse at 41% (n=55) and followed by None at 35% (n=48). The most common equipment used that had Other Misuse violation was foggers, accounting for 20 of the Other Misuse violations of which 9 cases were due to applying more than the recommended number of foggers.

Equipment	**Other Misuse**		**None**	
Aerosol Can	3	5.5%	12	25.0%
Aerosol/fog Generating Equipment	0	0.0%	2	4.2%
Foggers	20	36.4%	2	4.2%
Hand Pump Sprayer	5	9.1%	0	0.0%
Hand, Other or Unspecified	4	7.3%	9	18.8%
Immersion Equipment	1	1.8%	0	0.0%
Manual Placement	1	1.8%	7	14.6%
Not Applicable	12	21.8%	4	8.3%
Other	0	0.0%	2	4.2%
Unknown	3	5.5%	2	4.2%
Unpressurized Hand-held Spray Equipment	6	10.9%	8	16.7%
Activity				
Applicator	10	18.2%	17	35.4%
Mixer/Loader	1	1.8%	3	6.3%
Other	12	21.8%	7	14.6%
Routine	30	54.5%	18	37.5%
Unknown	2	3.6%	3	6.3%
Exposure				
Direct Spray/Squirt	2	3.6%	4	8.3%
Drift	7	12.7%	9	18.8%
Ingestion	16	29.1%	5	10.4%
Multiple Exposures	5	9.1%	7	14.6%
Other	4	7.3%	10	20.8%
Residue	6	10.9%	7	14.6%
Spill/Other Direct	11	20.0%	2	4.2%
Unknown	4	7.3%	4	8.3%

Of the 135 associated insecticide illness cases, 7 persons (5%) missed at least one day of work, school or normal activity. Five of these missed some work, but the exact number of days is unknown. Hospitalization occurred as a result of insecticide exposure in 8 cases. Two cases were hospitalized, but the number of days was not determined. Days hospitalized ranged from 1 to 13. The longest stay was due to intentional ingestion.

Antimicrobial

For the purposes of analyzing associated illnesses due to antimicrobial pesticides in urban areas, we included sanitizers, disinfectants, algaecides and molluscicides, and products such as household chlorine products, pine oil and quaternary ammonia as well as chemicals to treat pools and spas. Antimicrobials accounted for 34% (n=105) of associated non-occupational cases and 29% (n=79) of associated cases in Residential setting. A separate analysis of pesticide illness involving antimicrobials in greater detail may be found here.



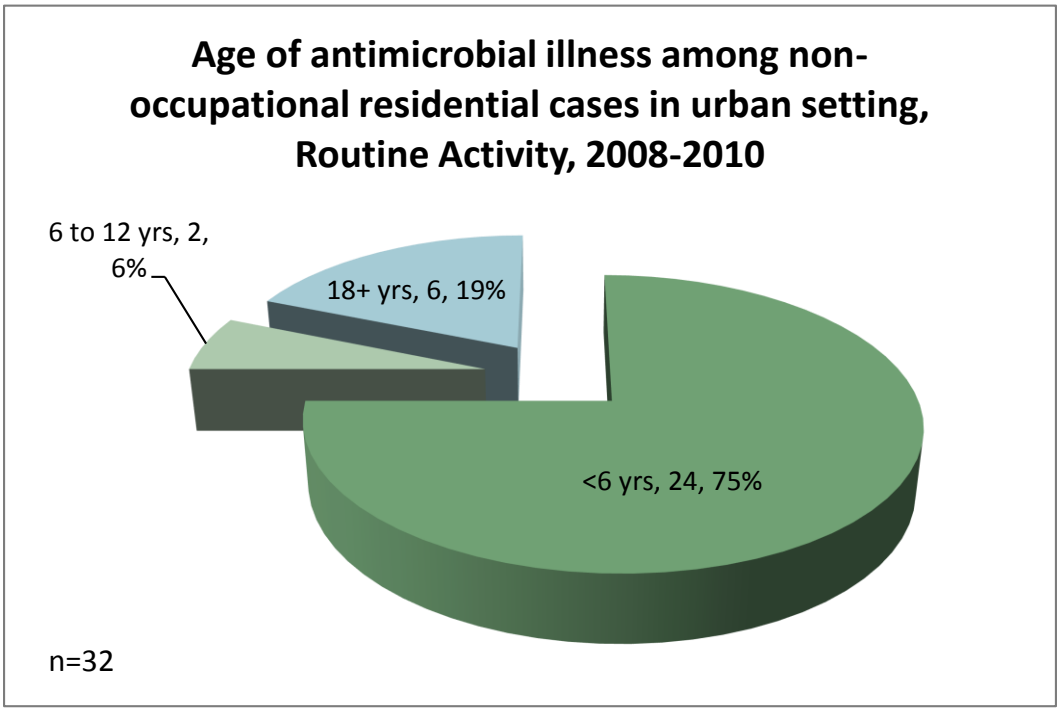
Of the 79 cases under review in Residential setting, products with Sodium Hypochlorite was the ingredient most used and was implicated in 43% (n=34) of the associated cases when used alone. An additional 23% (n=18) of associated cases were reported to have used Sodium Hypochlorite products in conjunction with other active ingredient(s). Quaternary Ammonia and Pine Oil were implicated in 4% and 1% (n=3, 1), respectively, in exposures of associated cases.

Antimicrobial - Activity	cases	%
Applicator	33	41.8%
Mixer/Loader	4	5.1%
Other	6	7.6%
Routine Indoor	30	38.0%
Routine Outdoor	2	2.5%
Transport/Storage/Disposal	0	0.0%
Unknown	4	5.1%
Total	79	

Applicator: Applies pesticides by any method or conducts activities considered ancillary to the application (e.g., cleans spray nozzles in the field).
Mixer/Loader: Mixes and/or loads pesticides. This includes: (1) removing a pesticide from its original container; (2) transferring the pesticide to a mixing or holding tank; (3) mixing pesticides prior to application; (4) driving a nurse rig; or (5) transferring the pesticide from a mix/holding tank or nurse rig to an application tank.
Other: Activity is not adequately described by any other activity category. This includes: 1) being inside a vehicle; 2) dog groomers not handling pesticides; 3) individuals handling pesticide treated wood; and 4) two or more activities with potential for pesticide exposure.
Routine Indoor: Conducts activities in an indoor environment with minimal expectation for exposure to pesticides. This includes people in offices and businesses, residential structures, etc. who are not handling pesticides.
Routine Outdoor: Conducts activities in an outdoor environment with minimal expectation for exposure to pesticides. This excludes field workers in agricultural fields. This includes gardeners who are not handling pesticides.
Transport/Storage/Disposal: Transports or stores pesticides between packaging and preparation for use. This includes shipping, warehousing and retailing as well as storage by the end-user prior to preparation for use. Disposal of unused pesticides is also included in this activity. This excludes driving a nurse rig to an application site.
Unknown: Activity is unknown.

Of the 79 associated antimicrobial cases, 41.8% (n=33) of the cases involved persons applying antimicrobials. Individuals who were performing routine activities (indoor and outdoor) followed a close second with 40.5% (n=32) when an exposure occurred.

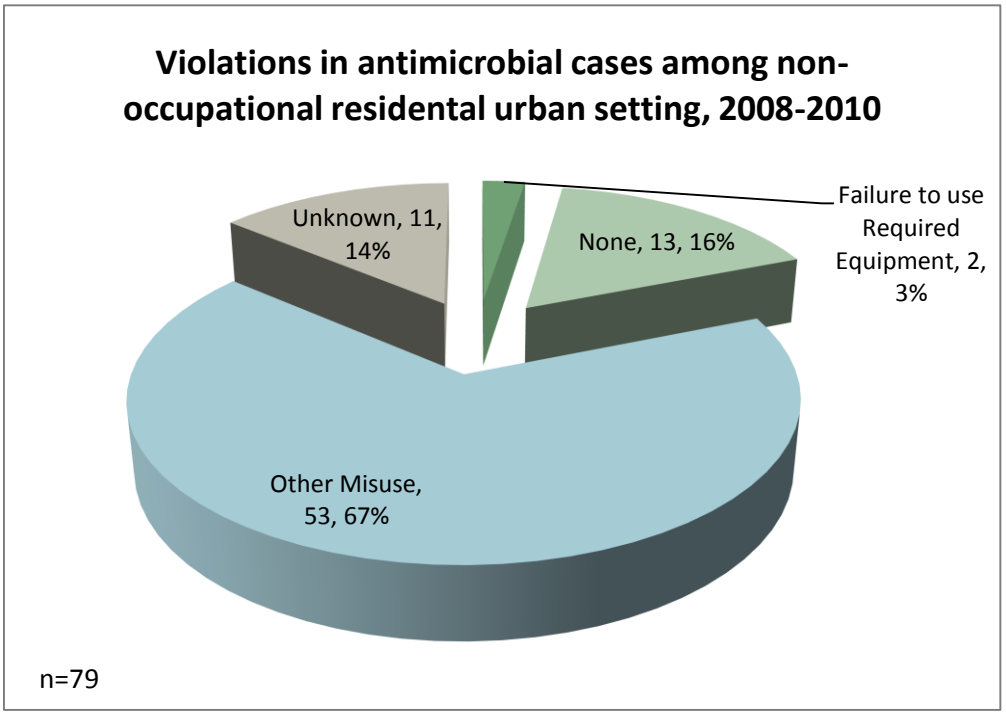
Of the 32 cases that were classified as Routine, children constituted 81% of associated antimicrobial cases with most under 6 years of age (75%, n=24). In some of the these cases, parents walked away for a moment while cleaning and leave the cleaning product within reach of a child. The child can grab the bottle or container and either squirt the bottle or ingest the product, as half of these cases were due to ingestion. In other cases, the child was nearby when the parent mixed two different ingredients causing chloramine gas to form.



Antimicrobial - Exposure	cases	%
Direct Spray/Squirt	4	5.1%
Drift	36	45.6%
Ingestion	23	29.1%
Multiple Exposures	2	2.5%
Other	1	1.3%
Residue	3	3.8%
Spill/Other Direct	6	7.6%
Unknown	4	5.1%
Total	79	

Direct Spray/Squirt: Material propelled by the application or mix/load equipment.
Drift: Spray, mist, fumes, or odor carried from the target site by air. Drift must be related to an application or mix/load activity.
Ingestion: Intentional or unintentional oral ingestion.
Multiple: Contact with pesticides occurred through two or more mechanisms.
Other: Other known route of exposure not included in other exposure categories.
Residue: The part of a pesticide that remains in the environment for a period of time following an application or drift.
Spill/Other Direct: Any of the following: 1) Contact made during an application or mixing/loading operation where the material is not propelled by the equipment; 2) Expected direct contact during use; 3) Leaks, spills, etc. not related to an application.
Unknown: Exposure is unknown.

Drift and Ingestion were the top two types of exposure in antimicrobial illnesses, 39% (n=36) and 27% (n=23) respectively. Of the 36 drift exposures, 26 involved the applicators. Of the 23 cases involving ingestion of an antimicrobial, 18 involved persons engaged in routine activities. Thirteen of these 18 cases involved children, in which most of the cases the cleaning product was stored in a cup, bowl or water bottle.



Early Reentry: Reentered a pesticide-treated area prior to the expiration of the restricted entry interval set by regulation or listed on the product label. This excludes reentry that meets the requirements specified by the California Code of Regulations (3CCR Sections 6770 and 6771).
Failure to Use Equipment: Did not use the required personal protective equipment (PPE) specified by the label or California Code of Regulations. This includes PPE not in good condition and applies whether or not the employer provided the PPE. Work clothes are not PPE. This only applies if the failure to wear the specified PPE contributed to the exposure
Other Misuse: Any violation of pesticide safety requirements other than those defined above. This only applies if not following the label or regulations contributed to the exposure.
None: Information provided in the investigation report shows no violation occurred. Specific statements reporting that "no violation was found" will be disregarded if the investigation report indicates otherwise.
Unknown: The type of violation that occurred, if any, is not known. This includes potential violations noted in the investigation, but not substantiated due to lack of evidence.

Other misuse accounted for 67% (n=53) of the violations in antimicrobial cases in Residential setting suggesting that residents may not be attentive when using these products. Removing the product from its original bottle into a beverage container is commonly seen in these incidents. Routine and Applicators were the top two activities, and Drift and Ingestion were the top two exposures.

Antimicrobial

Activity of Other Misuse Violation, Residential	
Applicator	19
Mixer/Loader	3
Other	6
Routine	24
Unknown	1

Antimicrobial

Exposure of Other Misuse Violation, Residential	
Direct Spray/Squirt	3
Drift	24
Ingestion	20
Multiple Exposures	1
Other	1
Residue	1
Spill/Other Direct	2
Unknown	1

Impressions for Non-occupational Cases

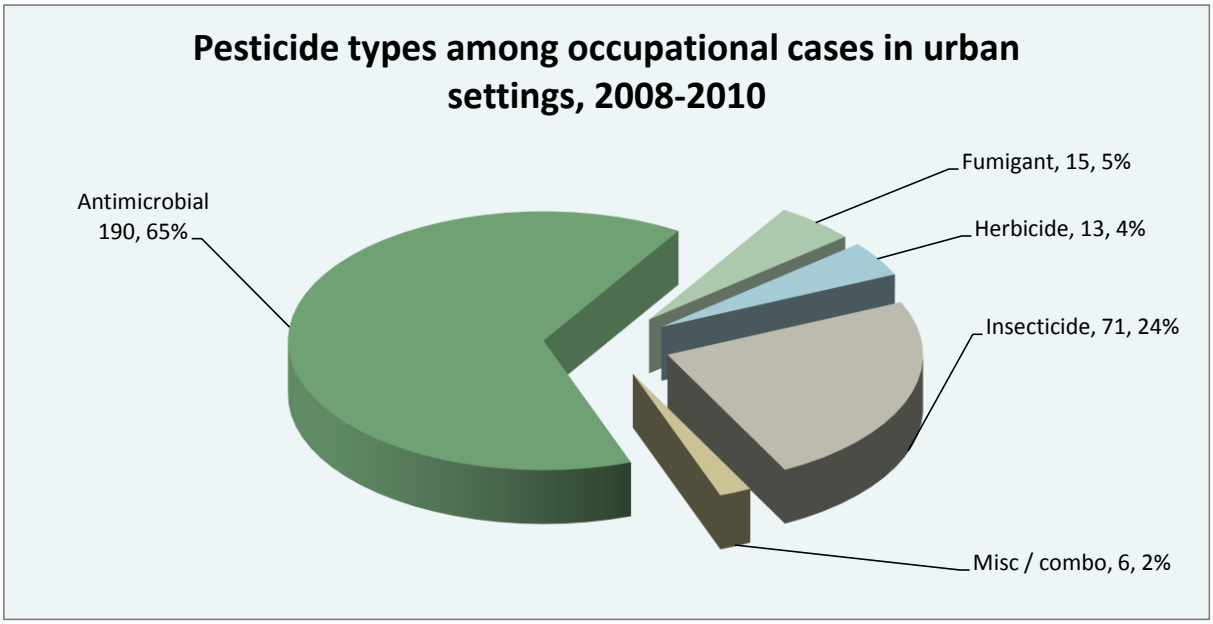
Antimicrobial and insecticide exposures are the two most common pesticide types that are associated with pesticide illness in a residential setting. Many of the incidents involving these two pesticides were due to the careless or inattentive behavior of the adults which affect the children in the household (33, 56% associated insecticide and 26, 81% associated antimicrobial illnesses). Many of the children unintentionally ingest the pesticide product when placed in a beverage container.

Although the majority of the insecticide related illnesses were due to Other Misuse, there were still a high percentage of cases in which there were no violations. A potential concern exists because these individuals performed the application according to label instructions and still became ill due to exposure to the pesticide.

Occupational Illnesses in Urban Settings

A total of 295 occupational illnesses were evaluated as associated with pesticide exposure from 2008-2010 in the sampled counties.

The majority of the cases (190, 65%) involved antimicrobials, followed by 71 cases (24%) of insecticide related illnesses.



The most common occupational exposure to pesticide was spill or other direct contact, affecting 109 (37%) of the 295 cases. Spill or other direct contact is defined as contact made during an application or mix/load operation where the material was not propelled by the equipment, expected direct contact during use, or leaks and spills not related to an application.

Exposure types among occupational illness cases in California from 2008-2010 in urban settings

Exposure	Cases
Direct Spray/Squirt	25
Drift	45
Ingestion	1
Multiple Exposures	2
Other	24
Residue	60
Spill/Other Direct	109
Unknown	29
Total	295

Drift: Spray, mist, fumes, or odor carried from the target site by air. Drift must be related to an application or mix/load activity.
Residue: The part of a pesticide that remains in the environment for a period of time following an application or drift.
Direct Spray/Squirt: Material propelled by the application or mix/load equipment.
Spill/Other Direct: Any of the following: 1) Contact made during an application or mixing/loading operation where the material is not propelled by the equipment; 2) Expected direct contact during use; 3) Leaks, spills, etc. not related to an application.
Ingestion: Intentional or unintentional oral ingestion.
Other: Other known route of exposure not included in other exposure categories.
Multiple: Contact with pesticides occurred through two or more mechanisms.

A range of equipment was used in the exposures, with various manual methods and automated chlorinators emerging as potential concerns.

Equipment	Cases	Notes
Aerosol Can	9	
Aerosol/fog Generating Equipment	23	22 from 3 incidents
Automatic Equipment, Chlorinators	24	
Automatic Equipment, Other or Unspecified	9	
Back Pack Sprayer	7	
Chamber	6	
Foggers	6	
Ground Boom, Other or Unspecified	2	
Ground, Other or Unspecified	1	
Hand Pump Sprayer	10	
Hand, Other or Unspecified	23	8 from one incident
Immersion Equipment	14	
Implements with Handles	8	
Implements without Handles	13	
Manual Application Methods, Other or Unspecified	18	
Manual Placement	14	
Not Applicable	28	
Other	6	
Pressurized Hose-line Sprayers	2	
Tarp	11	9 from one incident
Unknown	52	
Unpressurized Hand-held Spray Equipment	9	
Total	295	

Aerosol Can: Disposable pressurized cans designed for intermittent use.
Aerosol/Fog Generating Equipment: Refillable application equipment designed to disperse pesticide as a small airborne droplet, either in confined spaces or outdoor areas.
Automated equipment, chlorinator: Chlorination units that automatically inject chlorine into water for disinfection purposes.
Automated equipment, other or unspecified: Equipment that automatically injects the pesticide to the target area.
Back pack sprayer: Compressed air sprayer where the tank is worn on the back of the applicator.
Chamber: An enclosed, sealed chamber designed specifically for fumigating or sterilizing the contents of the chamber.
Fogger: Disposable pressurized cans designed for the total release of the contents in a single use.
Ground boom, other or unspecified: Ground application equipment with a spray boom.
Ground, other or unspecified: Ground application equipment, unknown or unspecified.
Hand pump sprayer: Hand-held compressed air sprayer with small volume tanks (1 to 5 gallons).
Hand, other or unspecified: Hand-held application equipment, other or unspecified. The equipment must propel the pesticide from a reservoir.
Immersion equipment: Tanks, trays, sinks, etc. used for the dipping of animals, produce, bulbs, medical equipment, dishes, pots and pans, etc.
Implements with handles: Mops, brushes, and other implements with handles.

Implements without handles: Cloths, towels, rags, sponges and other implements without handles.
Manual placement: Manual placement of a pesticide directly to a target site. This includes bait stations, hand tossed pellets, and direct pouring of a pesticide onto a target surface from a container.
Not applicable: No application equipment is involved.
Other: Any application methodology not described above.
Pressurized hose-line sprayers: Hand-held spray equipment attached by a long hose to a power pressurized tank.
Tarp: Tarp placed over a commodity or structure and designed to restrict a fumigant to the application site.
Unpressurized hand-held spray equipment: Hand-held spray bottles (usually plastic) with built-in finger triggers.

Of the 295 cases, 31 involved structural pest control operators (SPCO), and one illness at a landscape setting involved an agricultural pest control business (AgPCB).

Incident settings affecting more than 20 persons were further analyzed to determine specific exposure circumstances. The six settings highlighted below total 209 cases, which account for 71% of occupational illnesses in urban areas.

Incident Setting	Cases	Notes
Animal Premise (Veterinary Hospital, Kennels)	2	
Crop/Livestock Processing Facility	32	
Farm	1	
Forest	1	
Golf Course	1	
Hospital/Medical	33	
Industrial or Other Manufacturing Facility	25	8 SPCO
Landscape, Other	3	1 AgPCB
Livestock Production Facility	1	
Multi-unit Housing	7	
Office/Business	31	13 SPCO
Other (Telephone Poles, Fences, Etc)	16	3 SPCO
Park	3	
Pesticide Manufacturing Facility	1	
Prison	3	
Residential Institution	5	
Retail Establishment	13	
Road/Rail Or Utility Right Of Way	10	
School	21	1 SPCO
Service Establishment	67	2 SPCO
Single Family Home	9	1 SPCO
Unknown	5	1 SPCO
Wholesale Establishment	5	2 SPCO
Total	295	31 SPCO, 1 AgPCB

Service Establishments

Service establishments include restaurants, laundries, and other establishments engaged in providing services to individuals, businesses, and government. Service establishments are the most represented setting of all the occupational cases, with 67 pesticide illnesses. The majority of the cases affected one person, and 96% involved antimicrobials.

The mechanism of exposure involved a spill or other direct contact with pesticide in 37 (55%) of the cases. This means that over half of the illnesses occurred by contact made during an application or mixing and loading where the pesticide was not propelled by the equipment, expected contact during use (such as washing dishes in a sanitizing solution), or leaks and spills not related to an application. The most common active ingredients implicated in cases at service establishments were sodium hypochlorite and quaternary ammonium compounds.

Of the 67 illnesses that occurred at service establishments, 34 (51%) occurred at restaurants, cafes, or bars. Half of these illnesses involved failure to use required protective equipment (PPE), and four cases involved some other misuse of the product according to label instructions. Seven cases had no discernible violations, and in three cases potential violations remained unknown.

Seventeen (25%) of the 67 illnesses involved pool chemicals. Ten of the 17 pool-related illnesses occurred despite apparent compliance with label instructions.

Seven (10%) of the 67 illnesses affected janitorial workers. Six of the seven cases involved quaternary ammonia, and two were cited for failure to wear required PPE.

Hospital/Medical Setting

Medical settings were the location of 33 pesticide related illnesses. The majority were single-person incidents, 82% were related to antimicrobials, and 17 (52%) involved use of implements without handles such as sponges, rags, and wipes. Seven of the 17 resulted when a medical worker was splashed in the eye with disposable, pre-soaked quaternary ammonia wipes. Excess liquid in the container may be a contributory factor in these exposures. Eye protection is not required for all such products, but some facilities enforce the practice internally.

Another scenario common in the medical setting is inhalational exposure to glutaraldehyde, an exempted[†] product used to sterilize medical devices. Seven cases of exposure to glutaraldehyde occurred despite apparent compliance with label instructions.

[†] California law exempt certain pesticide products from registration, provided they meet certain criteria as defined in CCR section 6147.

Seven cases involved janitorial workers exposed to pesticides. Six of the seven were exposed to quaternary ammonium compounds, all sustaining eye injuries. Four of the seven were not wearing required PPE.

Five of the 33 cases at medical settings resulted in at least one known day of missed work.

Crop/Livestock Processing Facility

Thirteen episodes resulted in the pesticide illnesses of 32 individuals at crop or livestock processing facilities. This setting includes facilities involved in packing, manufacturing, or processing foods or beverages for human consumption and feed products for animals and fowl - including facilities that sort, grade, and pack fresh fruits and vegetables.

There were three multi-person episodes, two of which occurred two years apart at the same coffee milling warehouse. These involved drift and residue from aerosol/fog generating equipment, refillable application equipment designed to disperse insecticide as a small airborne droplet. Sixteen persons were exposed in these two episodes.
The remainder of crop or livestock processing facility illnesses involved antimicrobials and most were single person incidents.

Seven (44%) of the remaining 16 cases affected workers employed as janitors or sanitation workers. All committed some form of label violation: three were not wearing required PPE and four were cited for other misuse, defined as a violation other than early reentry or failure to use required PPE.

Office/Business Setting

Office settings were the site of 33 illnesses over 22 pesticide episodes. Thirteen of the 33 (40%) were related to structural pest control operations. One episode affected nine county workers exposed to residue after a fumigated building was cleared. The other episodes each affected one person.

Of the 20 cases not related to SPCO applications, eight involved janitors exposed to antimicrobials. Three of the janitor cases were not wearing the required PPE at the time of exposure, and one case did not follow label instructions. The remaining four were exposed despite apparent compliance.

Overall, no violations were apparent in 14 of the 33 office/business illnesses.

Industrial or Other Manufacturing Facility

This setting includes facilities involved in the mechanical or chemical transformations of materials or substances into new products. It does not include pesticide manufacturers or wood treatment facilities.

Seventeen episodes resulted in 25 cases of pesticide illness, including one 8-person episode involving structural pest control in a windowless building. In this incident, telemarketers developed symptoms after they returned to work two days after treatment.

Two of the 25 cases resulted in at least one known day of missed work, and one person was admitted to a hospital for a day.

Schools

PISP defines schools as establishments that provide academic or technical instruction. This includes elementary and secondary schools, post-secondary education, and daycare centers. A previously conducted analysis of elementary and secondary schools only is available here.

In school settings, 21 pesticide exposures resulted in illness, most affecting only one person. All were occupational in nature, and 18 of the 21 were a result of antimicrobial exposure.

Five of the 21 illnesses involved pool maintenance or lifeguards exposed to pool chemicals.

Eleven of the 21 illnesses were school janitors exposed to antimicrobials. Nine of the 11 janitor illnesses involved exposures to the eye, and seven of the 11 were not wearing required PPE.

Impressions for Occupational Cases

Antimicrobial exposures may be of particular concern among persons involved in janitorial or sanitation work. Custodial workers represent 41 (20%) of the 209 cases that were analyzed in detail. Of the 41, 25 (61%) sustained eye injuries. Twenty of the eye injuries (80%) involved spill or other direct contact of antimicrobials to the eye. Eighteen (72%) of the custodial eye injury cases were cited for failing to wear required PPE. It appears that PPE compliance or training may be insufficient in this population.

Though fewer cases resulted from cases involving swimming pools and spas, a potential concern exists because of the 22 pool-related occupational cases (which include lifeguards and maintenance personnel), 12 (55%) sustained illness despite apparent compliance with all label instruction.

Questions or comments may be directed to PISP scientists Lucy Graham (lucy.graham@cdpr.ca.gov, phone 916-445-4190) or April Holland (april.holland@cdpr.ca.gov, phone 916-445-3488).

Related Memoranda

Fogger memo: HSM-13006 http://www.cdpr.ca.gov/docs/whs/memo/hsm13006.pdf)
Antimicrobials memo: HSM-13013 http://www.cdpr.ca.gov/docs/whs/memo/hsm13013.pdf)
Schools memo: HSM-12009 http://www.cdpr.ca.gov/docs/whs/memo/hsm12009.pdf)

cc: Lisa Ross, Worker Health and Safety Chief, Environmental Program Manager II